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ABSTRACT

This module is an activity and film-oriented unit focusing on the importance of mangroves in the South Florida ecosystem. The module is part of a series designed to be used by teachers, students, and community members to help them utilize community resources in developing and teaching environmental concepts and responsibility, and in seeking ways to solve environmental problems. Background information, lesson plans (including procedure for building a mangrove model), and a copy of a pre-post test are provided. In addition to the general information presented in the background information section, six reasons why mangroves should not be allowed to be filled, bull-dozed, or altered in local counties or any other part of Florida are summarized. These reasons focus on mangrove productivity, shoreline protection and stabilization, runoff and pollution trap, wildlife habitat area, mangrove dollar economics, and uniqueness of the mangrove forests. (JN)

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STUDENT LEARNING ACTIVITY MODULE

A TWO LESSON UNIT

GRADES 7 and 8

Mangroves Build Land

"Mangroves are a valuable resource."



Produced by:

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Introduction

This module is an activity and film oriented unit. Make certain that the film, "Birth of a Florida Key", #12.074 is available from the Lee County Materials Center on the day you will need it.

Since many of us are unfamiliar with the importance of mangroves in the South Florida ecosystem a short background is provided.

Background on Mangroves:

"A CASE FOR MANGROVES"

by
William Hammond, Director
Environmental Education
Lee County, Florida

As people continue to settle in, and visit the Southwest Florida coastline in rapidly increasing numbers, the time for making irreversible decisions dealing with environmental quality and development is at hand.

To this date the final considerations concerning most mangrove fills have been primarily decided from the viewpoint of the economics of man rather than the economics of nature resulting in shortsightedness, little understanding of the overall outcomes and general disregard for the broad scale views or long term effects such decisions carry.

In this light, I would like to review the role of the estuary in Southwest Florida and, indeed, all of Florida.

An estuary can be defined as a semi-enclosed coastal body of water which has a free connection with the open sea and within which sea water is measurably diluted with fresh water drained from land drainage. Estuaries are the most productive environments on the earth.

Our estuaries are biological communities of extremely delicate balance. Dr. Clarence P. Idyll has suggested they may be the results of "a million years of balance." "Without doubt," Dr. Idyll (Univ. of Miami) testified at the recent oil drilling hearings in Tallahassee, "the most important message the ecologist must get across to the general public and to those responsible for making the laws and regulations of our country is that estuaries once destroyed are forever destroyed."

Dr. Eugene P. Odum of the University of Georgia read an important research paper at the 14th session of the Gulf and Caribbean Fisheries Institute in 1965.

He showed how marshes recycle phosphorus and nitrogen continuously, and how the vital plant food is produced throughout the year. He showed how marshes, often foul smelling, often slimy with algae, normally teeming with sandflies and mosquitoes, are nearly 7 times as productive as the average wheat field, 20 times as productive as the open sea, nearly twice as productive as the best corn land, and about equal in basic production of organic material to the annual production of sugar cane on rice land.

"The astonishing thing about all this is that man does not have to turn a hand to make this great crop ready for harvest. There is no fertilizer bill to pay, the food is produced free for the taking. But, it can be taken away by destruction of the factory --- the factory which relies upon abundant light and a dependable supply of nutrient materials. Production depends upon the rise and fall of the tides to transport the raw product to the waiting consumer."

This really is more significant to us when we realize that Dr. Odum's report was based on studies with salt marsh grasses (*Spartina* sp.) in Georgia and the Carolinas, whereas our mangrove forests in Southwest Florida have been shown to be substantially more productive than even the fertile salt marshes Dr. Odum describes. Dr. Eric Heald of the University of Miami research studies established a production figure for Red Mangrove in the Everglades basin at 8.8 tons/ha/yr., very significant when compared to the production figures for the forests of the world, which range from 2.5 to 6.8 metric tons/ha/yr.

Thus, even the laymen can see that our mangrove forests in Southwest Florida are the most productive forests in these entire United States and possibly, the entire world, with the exception of some tropical rainforests.

What does biological production mean in an estuary?

The productivity we speak of refers to the ability of the mangrove trees to transform sunlight, water and minerals into living material which is, in turn, shed into the estuary in the form of leaves, twigs, etc., called detritus. This detritus has been proven to be essential to the survival of almost all our fish, shrimp, crabs, shellfish, and other invertebrates, both in the estuary and offshore(since up to half the detritus is flushed out to sea to serve as food source for plankton and shellfish).

With this general overview of the importance of the mangrove dominated estuary system, I would like to briefly summarize six reasons mangroves should not be allowed to be filled, bull-dozed or altered in local counties or any other part of Florida.

1. Productivity - The predominantly Red Mangrove detrital based system is one of the most productive, biologically, in the world with all our commercial, sport, and intermediate living marine species depending upon its maintenance as a basic component in their survival.

i.e., In Boca Ciega Bay in St. Petersburg, Mr. Kenneth Woodburn, formerly of the State Board of Conservation Marine Research Division, reports biological surveys indicate a 90% reduction in all life forms, resulting from the finger canal dredge and fill activities in that bay. Mr. James Sykes, Director of the National Marine Fisheries Service Laboratory in St. Petersburg, referring to studies of Boca Ciega Bay and others, showed that "bay bottoms surrounded by finger fills undergo progressive siltation and remain biologically unproductive even after a decade."

2. Shoreline Protection and Stabilization - Red Mangroves are the primary back bay land builders and shoreline stabilizers. They assist, with their characteristic prop roots, in reducing runoff siltation by acting as wave energy absorbers, thereby preventing wave and tidal

erosion along shorelines. They serve as one of the most effective means of coastal hurricane buffers, protecting upland populations and properties from flooding and wave generation destruction by absorbing and diffusing wave shocks and mechanically retarding rising floodwaters.

3. Runoff and Pollution Filter Trap - Recent research at the University of South Florida indicates the mangrove dominated estuary serves as a very effective absorber of pollutants, particularly raw domestic sewage. The mangroves and particularly, the organisms associated with them, absorb and utilize these types of pollutants effectively at no cost to the taxpayers.

One can only surmise what effect removing mangroves will have on Coliform bacteria counts in our bays and rivers with large areas of counties on septic tanks or package sewer plants draining and seeping into the creeks and drainage ditches which all end up in our bays. It is, however, quite conceivable that the borderline bacteria counts now existing will no longer merely be borderline for swimming and recreation if mangroves are removed.

4. Wildlife Habitat Area - The Red Mangrove and the associated black mangrove forests and keys are the major breeding and feeding grounds for a majority of our wading birds, estuarine fish, and invertebrates, not to mention the endangered Pelican, Bald Eagle, and shellfish.

In addition, Dr. William Odum's research points out the key role that black mangrove plays as essential nursery ground for many gamefish (Redfish, Sea trout, Snook, etc.) and other juvenile wildlife forms --- a role that has been overlooked by many.

Whether we are sophisticated enough to realize it or not, the well being and survival of these organisms is essential to many forms of

wildlife and is continually being consumed and the resultant decrease in associated wildlife is evident. It is not a question of man or wildlife but of man and wildlife.

5. Mangrove Dollar Economics - In an address to the University of Florida Bulkhead Seminar and published in the C - 70's Legislators' Environmental Guide (Sept. 1969), Mr. John McQuigg reported on the economic value of mangroves and shorelines based on 1964 statewide statistics, all documented and accounted for and very conservative in estimates, and established the production value of each acre of Florida estuary at \$22,210.80 per acre of estuary bottomlands, primarily mangrove and seagrasses. This figure can be easily substantiated and makes the filling of mangrove properties for the \$500 - \$2000 a developed acre brings into the county tax rolls (from people who could live elsewhere in the community) absurd for anyone but the developer making the profit to consider. What about the public interests?
6. Uniqueness of the Mangrove Forests - In all of the United States the only substantial Mangrove Forests exist in S.W. Florida, particularly southern Sarasota, Lee, Charlotte, Collier, and Everglades National Park, along with forest remnants on the lower east coast of Florida. These forests were considered, particularly in Lee County, to be unique enough to become the first Aquatic Preserves, the nucleus for a major National Wildlife Refuge and a State Park. We are being hasty, indeed, when we are so anxious to remove the productive estuary producer that others throughout the state and nation have judged as truly unique.

Is the developer, businessman, zoning representative, and commissioner who is ready to see the mangroves filled for immediate profits and population growth really as competent and intelligent as he purports? Has, in fact, a scientific, comprehensive study of why and what

the tourist and settler seek out in South Florida been accomplished and made public? Could it be that South Florida now offers a different productive estuary system and all the good things that go with it, when compared to the majority of the remaining "developed" coastlines which, aside from the beaches beyond the buildings, are really not much different from one another? Indeed, it is the very unique productive estuary condition present that attracts people to South Florida and now needs protection from those same people it has attracted.

Therefore, it is essential if South Florida counties are going to remain unique that:

1. An immediate moratorium be placed on all bulkhead applications.
2. The local County Commissioners adopt new ordinances (as within the powers granted them during the 1971 legislative session) to establish a bulkhead line which is consistent with the shoreward border of *Rhizophora mangle* (Red Mangroves) or, better yet, adding the shoreward border of any pure stand of Black Mangrove. Ideally, the bulkhead line should be set at the transition zone of marine and upland plant communities.

Unfortunately, while biologically sound, this line is politically and economically unattainable in today's society.

3. The County Commissioners should set up a comprehensive zoning study and plan for carefully regulating the type of development and population density allowable on the fragile estuary flood plain.

In effect, the Red Mangrove and Cordgrass or *Spartina*, along with those areas with pure stands of black mangroves, should be excluded from development (excepting shrub sized Red Mangrove trees which may be growing upland of the mean high water line). White mangroves and/or buttonwood would be

developable. Mixed stands of trees which include black mangrove should be developed only with careful considerations of the developer with county officials and State Biologists.

In conclusion:

"We advertise the beauties and attractions of Florida; we send our agents and literature to call the people of the northland to come and spend their winters and to be permanent residents with us. Then we destroy every vestige of its natural beauty, we cut down the hammocks, drain the lakes and mutilate the rivers. We clear out the mangrove borders which nature created to guard our shores from destruction by the sea during hurricanes and in their places we build hideous seawalls. The only attraction belonging to the State that we do not ruin is the climate ---"* and now we are working on that with air pollution and climate alteration through land drainage.

Isn't it time we learned from the past as time is rapidly running out!

*From Simpson's "Out of Doors in Florida", (pp. 136-137, reprinted in 18th Annual Report of the Florida State Geological Survey, 1927.)

Lesson One

A. Give pre-test (see Appendix).

B. Activity - Building a Mangrove Model

1. Materials:

- a. One 6 inch by 6 inch cardboard square and 30 straight pins per group.

2. Procedure:

- a. Divide the class into groups of two or three students per group.
- b. Give each group a cardboard square and 30 straight pins.
- c. Take the class outside to a sandy area. Usually dry sand can be found around the edge of the school building.
- d. Have the students place the cardboard square on the ground. The squares should be inclined at about a 45 degree angle. This can be done by placing sand under one end of the square.

3. Activity Procedure:

- a. Briefly discuss the role of red mangroves in the estuary system in South Florida (see background information in the Introduction). Discuss the effect of the prop roots in trapping materials, with the resultant buildup of land masses.
- b. Now explain that the 30 straight pins represent prop roots. The object is to stop sand from sliding down the cardboard square by sticking pins in the cardboard. The sand should be stopped over the entire width of the incline.

4. Rules

- a. The 30 pins represent six years of mangrove growth.
- b. Each group gets six chances to stop sand movement. Five pins are used for the first trial, and five pins are added for each

successive trial. During each trial, a small handful of sand should be used. The pins any be placed in any manner the students want.

4. Discussion of Activity

1. Bring out the similarity between the pins and prop roots.
2. Ask students if the material caught between the pins helped to catch and hold new material, thus building up the soil faster.

Lesson Two

- A. Show film - "Birth of a Florida Key", #12.074 available from the Lee County Materials Center.
 - 1. Have a short film discussion and bring out some of the ideas in the background material in the introduction of this unit.
- B. Give post-test (see Appendix).

APPENDIX

1. Pre/Post Test

Pre/Post Test

Have the students answer the pre-test questions during Lesson One. Make certain that they place their names and the word Pre on the answer page.

Give the post-test at the end of Lesson Two. Again make certain that the student's name is on the test.

Compare results between pre and post testing. A class average well above 50% increase should be found.

Questions: True or False

1. Mangroves are trees.
2. Trees that live near shorelines always get washed away.
3. Mangrove roots act as "land collectors".
4. Shorelines are always being washed away.
5. Mangroves have stilt-like prop roots.

LEE COUNTY
ENVIRONMENTAL EDUCATION PROGRAM

TITLE III E.S.E.A. 306

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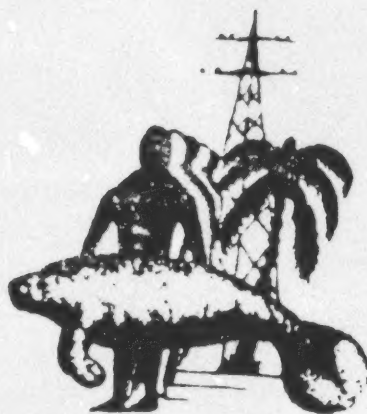
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